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THE RELATION BETWEEN THE PHYSICAL AND THE HEALTH CONDITIONS OF CHILDREN AND THEIR SCHOOL PROGRESS

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The question of the correlation between the physical and health conditions of school children and their mental progress is one that has received a great deal of attention from educators and the medical profession during the past twenty years. It has been the subject of numerous investigations and much speculation, but no altogether satisfactory answer has yet been given. Some have maintained that there is a positive correlation between mental precocity and good physical development and condition, and between dulness and poor physical condition; while others have declared that the relation in the one case is inverse, and in the other slight, if there is any at all. However, the data so far gathered do not warrant the acceptance of a causal relationship between bodily and mental defectiveness, although they do clearly justify the belief that bodily condition is an important means to mental welfare, and that attention given to the investigation and treatment of physical conditions of children often results in the elimination of wasted effort in education and in the improvement of school work.

The following study makes no attempt to prove or disprove a theory, or to establish a mathematical correlation between physical defects and school progress. It merely presents a statement of the relationship that was found to exist in a certain city school, (1) between the physical condition of the children and their mental progress (*a*) as measured by standing in class, (*b*) as measured by completed work; (2) between the nutritional and developmental conditions of the children and their standing in class; (3) between physical defects, attendance, and class standing; (4) between the social status of the child and each of the above topics.

In the first place, a careful medical examination of all the children of the school was made by a well-qualified school physician. The following facts were recorded: number and condition of carious teeth; condition of eyes and vision; throat obstructions, such as enlarged tonsils, adenoids, and nasal abnormalities which obstructed respiration; ear defects; and general bodily condition.

Secondly, each teacher was asked to submit a list of her pupils by grades, arranged in the order of their ability to do the regular work of the class. These lists were then divided into equal tertiles, and all of the first tertiles of the different lists were grouped, as were the second and third. These are designated throughout the study as Rank I, II, and III. Thus, the group marked I was supposed to contain the best third of each class, and likewise the groups marked II and III the middle and poorest thirds respectively. This method of classification is certainly more reliable than either general averages based on the results of examinations, or the arbitrary judgments of teachers on such criteria as bright, average, and dull. Furthermore, as the lists were made out near the end of the school year, the chances of a reliable judgment of the ability of each pupil were increased, as pupils who were members of the school at that time should have been doing either their best or poorest work.

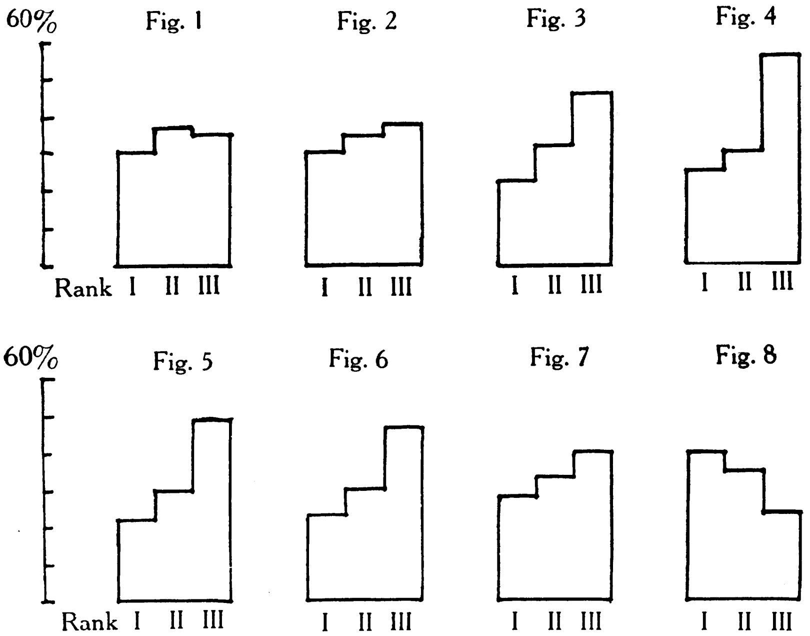
PHYSICAL DEFECTS AND CLASS STANDING

Chart I that follows was compiled from data gathered from 122 children having dental caries (Fig. 1); from 181 children who had other defects in addition to decayed teeth (Fig. 2); from 35 children who had throat obstructions only (Fig. 3); from 64 children who had other defects plus those of the throat (Fig. 4); from 56 children who had defective vision only (Fig. 5); from 105 children who had other defects in addition to those of vision (Fig. 6); from a total of 256 children having the different kinds of defects (Fig. 7); and from 172 who appeared to be physically normal, i.e., they had no evident physical defects (Fig. 8).

It was my intention to construct figures showing the distribution of pupils having carious teeth and defective vision, carious teeth and throat obstructions, and defective vision and throat obstructions; but the cases of such combinations were too few in number. Such a series would have shown clearly and completely the cumulative effect of the different physical defects on class standing and would have made possible a more minute analysis and a more thorough comparison than can be made from Chart I.

An examination of the first seven figures of Chart I shows a consistent relationship between the different physical defects and class standing. The uniformity of the skew in the curves toward the foot of the class rather than the exact percentages makes the relation significant. It becomes even more significant when compared with Fig. 8, which shows the distribution of the children who were considered normal physically. In Fig. 8, the skew is toward the head of the class and is almost identical in degree with

CHART I



The abscissa shows the first, second, and third tertiles of the classes; and the ordinate the percentages of children. Fig. 1 shows that 30 per cent of 122 children having defective teeth belonged in the first third of the classes of the different grades, 36 per cent in the second third, and 34 per cent in the lowest third.

that of Fig. 7, which shows the distribution according to class standing of all the children who had physical defects.

PHYSICAL DEFECTS AND COMPLETED WORK

The bearing of physical defects on school progress as measured by completed work is a problem with which it is more difficult to deal, especially with any degree of accuracy. This is self-evident to those who know the extent to which promotion in our schools is influenced and controlled by administrative problems. As a result the general statistics of promotion are unreliable when dealt with in mass, regardless of the facts which determine their validity. As a matter of fact the only statistics worth considering in this connection are those in which the personal record of each child considered is known by the statistician.

The school in which these data were gathered is a fourteen-room, eight-grade elementary school located in a fairly populous district of people of moderate means. It is well adapted for a study of this kind, as a well-established precedent for individual promotion prevails among the teachers. The unit of work is so small (four quarters of ten weeks each) that retardation is minimized, and the classes as a rule are not overcrowded. However, the difficulty lies in the fact that it was impossible to secure either a large number of records, or those covering more than a single year's work.

In Chart II that follows, the abscissa shows the number of quarters of work completed during the year by 172 pupils who were considered normal physically (Fig. 1), and by 278 pupils who had physical defects (Fig. 2). The ordinate shows the distribution of pupils in percentages.

The curves of Chart II show, as do those of Chart I, that the normal children excel those having physical defects, although the advantage in completed work is not so marked as in class standing. The height of the apex of the curve is not so significant, as it is determined largely by the regular class promotions; but the distribution on either side showing gain or loss in finished work, by individuals, in comparison with the class, is important; for it is the measure of individual progress. Here, on the lower side we find

18.5 per cent of the normal children (Fig. 1) against 27.5 per cent of the children with physical defects (Fig. 2), while on the higher side we see 19.5 per cent of the normals (Fig. 1) against 16.5 per cent of the children who had defects (Fig. 2).

NUTRITION, DEVELOPMENT, AND CLASS STANDING

A second examination of all the children was made by the school physician, in which special attention was given to nutrition and development. In grading nutrition, the color of the visible mucous membranes, conditions of the skin, muscular tone, and carriage of the body were carefully observed; and in grading development, approximate height and weight for age, muscular and adipose proportion, formation of mouth, and general contour of the body received attention. As we had no scale by which to be guided in this undertaking, it was agreed to rank all pupils who appeared to grade above 85 per cent on the above points as first class, all between 85 per cent and 70 per cent as second class, and those below 70 per cent as third class. In order to have a check on the physician's grading, we compared his judgments with the results of a blood test that had been made with the Haemoglobin Scale, in the case of 15 pupils. The judgments conformed in each case; 8 who had been classed I by the physician tested above 85 per cent on the Haemoglobin Scale; 6 who had been classed II graded

CHART II

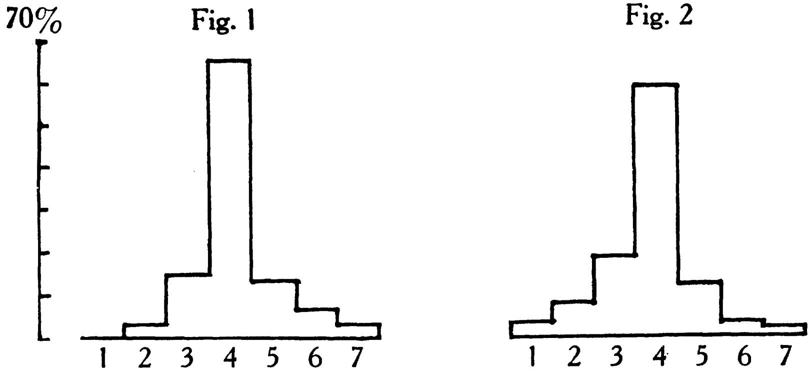


Fig. 1

Fig. 2

between 85 per cent and 70 per cent, and 1 who had been rated III graded below 70 per cent.

In compiling the following Chart III, it was found that the cases marked below 70 per cent in either nutrition or development were so few in number that it was thought best to drop them and consider only those graded I and II.

A comparison of Figs. 1 and 2 of Chart III shows that the children marked I in nutrition stand somewhat higher in the class than those marked II; and a comparison of Figs. 3 and 4 show similar but more marked results in regard to development. The flattening of the curves in Figs. 1 and 3 seems to have been caused by the fact that the line of demarkation between the two classes in both nutrition and development was not properly drawn. Group I in nutrition contained 65 pupils that should have been in Group II, while Group I in development contained 77 that should have been classed with Group II. The probability is that this rearrangement would have increased the skew of the curves in Figs. 1 and 3 toward the head of the class, and would have decreased the skew in Figs. 2 and 4 toward the foot of the class.

CHART III

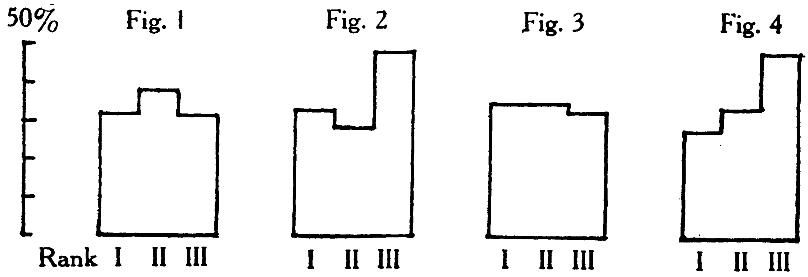


Fig. 1 shows class standing of 297 pupils graded 1 in nutrition
Fig. 2 shows class standing of 168 pupils graded 2 in nutrition
Fig. 3 shows class standing of 310 pupils graded 1 in development
Fig. 4 shows class standing of 155 pupils graded 2 in development

In Table I (p. 102) which shows the distribution of the various groups of children distributed according to their percentage of attendance, two facts of considerable importance stand out:

(1) the correlation between good physical condition and a high percentage of attendance; (2) the bearing of attendance on class standing.

PHYSICAL DEFECTS, ATTENDANCE, AND CLASS STANDING

TABLE I

	Percentage										
	100–95	94–90	89–85	84–80	79–75	74–70	69–65	64–60	59–55	54 and Less	No. Cases
Normal children	31.2	24.0	15.0	9.1	4.5	5.2	4.5	2.6	1.3	2.6	154
Physically defective	24.5	26.8	13.8	10.4	8.9	5.7	4.6	1.1	0.0	4.2	261
Nutrition I	28.7	24.4	13.9	9.7	7.0	6.2	4.6	1.6	0.4	3.5	258
Nutrition II	24.2	28.0	14.6	10.2	7.6	6.6	6.6	1.9	0.6	3.8	157
Development I	27.8	22.2	14.8	10.4	8.5	6.3	4.8	1.5	0.4	3.3	270
Development II	25.7	32.6	13.2	8.3	4.8	4.2	4.2	2.1	0.7	4.2	144
Rank I in class	39.4	27.7	13.1	3.6	5.8	5.1	3.6	0.7	0.0	1.0	137
Rank II in class	25.5	28.5	15.3	12.4	8.0	2.9	2.2	1.5	1.5	2.2	137
Rank III in class	16.3	21.2	14.2	13.5	7.8	8.6	7.8	2.8	0.0	7.8	141

NOTE.—The percentage of attendance is based on the actual days attended out of a possible 200 days, the length of the school term.

The fact that 31.2 per cent of the normal children attained a percentage of 95 or above, against 25.4 per cent of the children who had physical defects is no statistical accident, as is likewise true of the children graded higher in nutrition and development. Physical defects and poor nutrition and development are conducive to intermittent absence which in the course of a school year is destructive to a high percentage of attendance.

The results of intermittent attendance may not be seen in the progress of a pupil from grade to grade, yet they are quite evident in the standing of the individual in class. This is clearly demonstrated by the percentages given above, in which 34.9 per cent of the pupils of Rank I in class have a percentage of attendance of 95 or more against 25.5 per cent of Rank II, and 16.3 per cent of Rank III. It is further demonstrated in the case of pupils attending 54 per cent or less of the time, where we find 7.8 per cent ranking III in class against 2.2 per cent ranking II, and 1 per cent ranking I.

These facts indicate a causal relationship between physical condition and attendance, and a close correlation between high standing in class and a high percentage of attendance. They offer ample justification for the existence in every modern school system of a competent attendance department and an active efficient department of hygiene.

SOCIAL STATUS AND EACH OF THE ABOVE TOPICS

The question now arises, Are physical condition and attendance independent factors in influencing school progress, or are they the result of some other influence, such as environment? The only data at hand in which an answer to this question might be found were the occupations of the parents. It was therefore decided to arrange this material in a similar way to that employed by Dr. Porter[1] in working out his conclusions regarding the correlation between the physical and mental attainments and the social status of the pupil, as determined by the occupation of the parent.

The parents were divided into two groups designated as (1) professional men and the mercantile class, and (2) manual tradesmen. It was found that there were 135 parents in the first group, and 280 in the second (including duplications where the parent had more than one child in the lists). The children of these parents were then distributed according to the parental occupation, class standing, and physical condition.

TABLE II

Parentage	Percentage		
	Rank I	Rank II	Rank III
Professional men and mercantile class....	44.7	27.7	27.6
Manual tradesmen......................	27.1	37.3	35.7

Table II, giving the distribution according to class standing of the children of the two groups, shows that parentage (in the sense of the home maintained by the men of different occupations) bears a relation to the character of the work done by the pupil in school. This may be due to the attitude of the men of different vocations toward the content of our course of instruction in the public schools, or to reasons more closely related to the topics previously considered. The latter point calls for further analysis, on account of the close similarity in distribution between the above groups, and those of the normal and physically defective children respectively. See Figs. 7 and 8 of Chart I.

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[1] Porter, "Growth of Saint Louis School Children," *Transactions of the Academy of Science of Saint Louis*, Vol. VI.

By separating the normal children and the physically defective according to parentage, and then distributing according to class standing, we see that physical conditions still appear to influence class standing regardless of the supplementary or counter influences that may result from different home conditions. However, the influences of the homes do appear to accentuate in their respective direction the correlation between physical condition and standing in class. See Tables III and IV.

TABLE III

NORMAL CHILDREN

PARENTAGE	PERCENTAGE		
	Rank I	Rank II	Rank III
Professional and mercantile class.........	58.7	19.6	21.7
Manual tradesmen......................	37.7	45.9	16.4

NOTE.—In the group of normal children, 48 came from homes of the professional and mercantile class, and 98 from the homes of manual tradesmen.

TABLE IV

CHILDREN WITH PHYSICAL DEFECTS

PARENTAGE	PERCENTAGE		
	Rank I	Rank II	Rank III
Professional and mercantile class.........	37.5	32.9	29.6
Manual tradesmen......................	21.4	32.4	46.4

NOTE.—Of the children who had physical defects, 88 came from the homes of the professional and mercantile class, and 182 from the homes of manual tradesmen.

The children of the two classes of parentage were next distributed according to their percentage of attendance, and arranged in Table V. By comparing this distribution with that of the normal and physically defective groups in Table I, we see that the different homes assert their influence on attendance, although in no more marked degree than on standing in class.

TABLE V

PERCENTAGE OF ATTENDANCE

PARENTAGE	PERCENTAGE									
	100–95	94–90	89–85	84–80	79–75	74–70	69–65	64–60	59–55	54 and Less
Professional and mercantile class	37.0	26.0	12.6	6.7	6.6	6.0	1.5	7.0	0.0	2.1
Manual tradesmen	22.2	25.8	14.6	11.4	7.5	5.3	6.1	2.1	0.7	4.3

These data clearly show that physical condition, attendance, and home environment are as a rule related factors, and that they seldom act as units on the work of the children in school. Because of this, a correlation that would even approach mathematical accuracy would be very difficult to establish, as in most cases it would be impossible to isolate the different influences in their bearing on school progress. However, the study does point out that the correlation between any of the factors and the character of work done in school is positive, and as such merits the careful consideration of administrators, supervisors, and teachers.